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Xiang Chen, ***Instrumental Traditions and Theories of Light: The Uses of Instruments in the Optical Revolution*****.** Science and Philosophy, 9. Dordrecht, Boston and London: Kluwer Academic Publishers, 2000. Pp. xxiii + 211. ISBN 0-7923-6349-3. £60.00, $99.00 (hardback).

The relationship between scientific instruments, communities of practitioners and the trajectory of science has been studied increasingly by historians of science over the past decade. This book, part of a series entitled *Science and Philosophy*, is a contribution to the rapidly developing field.

The 'optical revolution' (an uncommon and contentious label) refers to theoretical rejection of the particle theory of light by the wave theory during the nineteenth-century. Xiang Chen argues that optical instruments were important tools in this overthrow of one intellectual framework by the other.

Central to the book is the author's notion of an 'instrumental tradition'. He bases this on operational, rather than technical, aspects – on the "procedures adopted by a community concerning the proper uses of instruments" (p. xvi). Two distinct traditions are identified: a 'visual tradition', based on "faith in the eye", and a 'geometrical tradition', "rooted in doubts about the reliability of the eye" (pp. 122 and xvii). These traditions are not as clear-cut as they first appear. Chen identifies practitioners in the visual tradition who are careful to adopt procedures to ensure that observation is made under optimal conditions; geometrical practitioners, similarly, regard the eye as an imperfect optical element, but seek to minimise its role or to replace it entirely. Thus Chen places the seemingly different extinction photometer and shadow photometer – the one founded on detection of a threshold brightness, the other on the matching of the contrasts of shadows – in the same category (visual) by claiming a similarity of procedural aspects. Nor are the traditions readily distinguishable in a sociological sense: "not everyone in the community always acts according to the better exemplars set up by the tradition" and "we should not be surprised to find someone who adopts procedures endorsed by one tradition in some cases, but switches to a different set of procedures belonging to another tradition under different circumstances" (p. xviii). Thus the traditions are rather more permeable or fluid than the major model that the author cites, Peter Galison's *Image and Logic* (1997). But unlike microphysics, we find in Chen's cases no 'pidgins' or 'creoles' devised to foster crude communication between separate communities, nor 'trading zones' to share information and theory obtained from segregated technical cultures. Instead, Chen argues that optical instruments during the early nineteenth century were employed to stabilise support for both the particle and wave theories.

Interestingly, instruments of the mid- to late-19th century get little discussion. This is a pity, as interferometers displayed new phenomena of considerable importance in buttressing the wave theory of light, and crystallised their own distinct grouping of practitioners. Such groups, which by the 1860s included nascent spectroscopists and disparate specialists of photometry, are never revealed in the

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book. Indeed, the historical context of the cases is not always well described, nor are the cases that are discussed clearly motivated. A chapter on photometry, for example, relies almost exclusively on the publications of Richard Potter, Professor of Natural Philosophy and Astronomy at University College, London during the 1830s and 40s. Good line drawings illustrate the principles of the instruments clearly (on the other hand, a minor criticism is the more than the usual number of typographical errors and, in my copy at least, several pages with blurred printing). Experimental practise is not clearly described. Tables commonly list measurements to tenths or even thousandths of a percentage while, as Chen himself notes, contemporary practitioners found precision better than one or two percent impossible to better. Other chapters devoted to optical dispersion and polarisation are similar in sketching simple technical details to focus on the theoretical tests provided by the instruments. The penultimate chapter more interestingly discusses optical toys such as stereoscopes, stroboscopes and kaleidoscopes for studying the nature of visual perception and so strengthening the visual tradition.

While the subtitle, *The Uses of Instruments in the Optical Revolution*, highlights the book's theme of competition between the particle and wave theories of light, the author admits that the contention quietly defused by the end of the century: "…both sides in the debate became apathetic about the question of the nature of light…the closure of the "optical revolution" took the form of proliferation of disciplines, rather than a replacement of a theory by another" (p. xxiii). Thus the social differentiation mediated by instruments appears to have been at least as important as their role in supporting theory.

Categorisation, a central theme of this book, is also a problem in describing its approach. As already mentioned, it does not focus on either historical or sociological analysis. Analogies with Galison's studies of instruments are not explored to advantage. Nor is other recent work elicited for support, such as Terry Shinn's elaboration of 'research-technologies' as specialisms frequently centred on practitioners developing instruments. The philosophical basis of the book, while drawing connections most clearly with the work of Thomas Kuhn, is not linked to more current ideas, such as Davis Baird's work in the philosophy of instruments or to other strands in the philosophy of technology. By contrast, the notion of a visual tradition in instrumentation is one that promises to be an active research area for the foreseeable future.

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